Government of Canada / Gouvernement du Canada

Evaluation of the Limit Reference Point for Northern Cod

January 29, 2019

Canada

Outline

- Purpose of this briefing
- How we develop our science advice
- The Precautionary Approach
- Reference points
- How science determined the Limit Reference Point
- Results of 2019 peer review process

Purpose of this briefing

- Clarify our regional peer review process and the Precautionary Approach used to manage stocks, including Northern cod.

- Share the results of the Canadian Science Advisory Secretariat (CSAS) regional peer review process held January 22 & 23 that evaluated the Limit Reference Point for 2J3KL Northern cod.

How we develop our science advice

Regional peer review process

- Meeting of scientific and other technical experts with the purpose of reaching consensus on the information presented.
- Overall objective is to provide the best science advice to the Minister, managers, stakeholders and the public.
- Advice based only on rigorous peer review of relevant scientific data and information (not on external considerations such as the impacts of future decisions or socio-economic considerations).

What is CSAS?

A national body that oversees the review and provision of science advice to inform DFO management decisions. Specifically, this group helps organize meetings where DFO scientists, biologists and others, including fish harvesters, university researchers, Indigenous groups, and other technical experts get together to review scientific information and help inform how commercial fish stocks are managed.

The Precautionary Approach (PA)

- Management framework used to determine catch limits and/or other management actions with the intention to:
  - keep removals moderate when stocks are healthy
  - promote rebuilding when stocks are low
  - ensure low risk of harm to the stocks

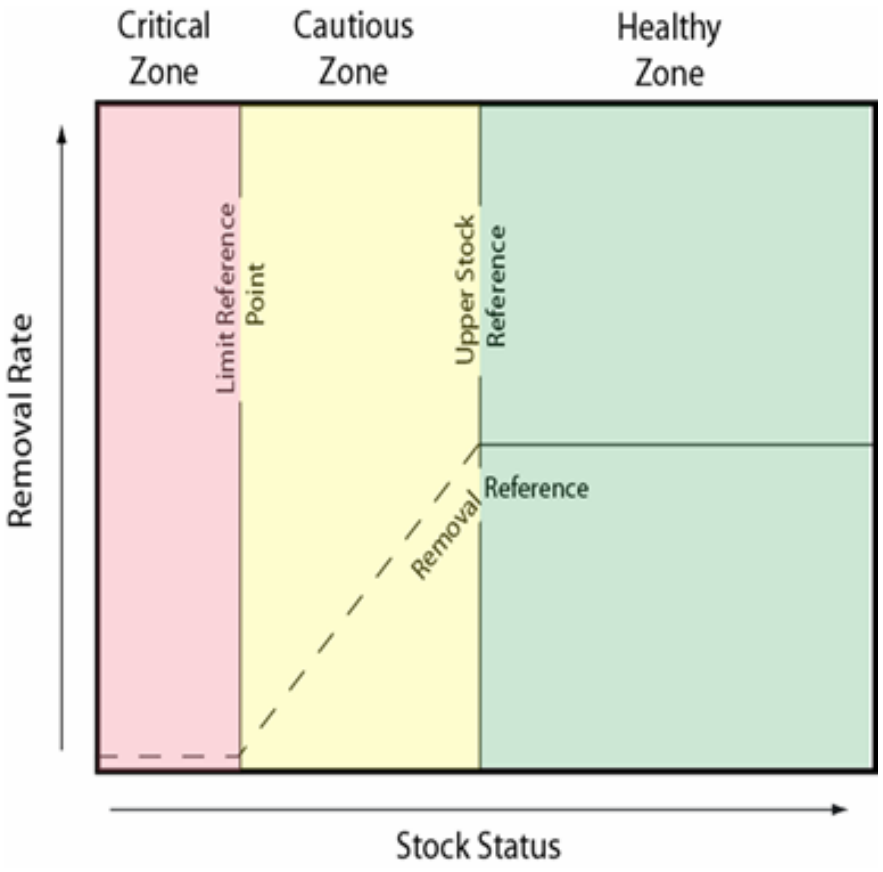
- PA includes:
  - Stock status zones (Critical, Cautious and Healthy)
  - Reference points (Limit, Upper Stock, and Removal Reference points)
  - Harvest Control Rules

This framework is used in the management of many commercial species in Canada, including Northern shrimp, Northern cod and Atlantic salmon in this region.

Reference points

- **Limit Reference:** represents the stock status below which *serious harm* is occurring to the stock. Fishing is to be kept to the lowest possible level below the LRP.

- **Upper stock Reference:** represents a threshold below which catch must be progressively reduced in order to avoid reaching the Limit Reference Point.



The roles of science and management

- DFO science determines the **Limit Reference Point** and provides an estimate of stock size in relation to the Precautionary Approach framework.

- Fisheries managers consider this information when making decisions or recommendations about a particular stock, in this case, Northern cod.

How science determined the Limit Reference Point (LRP) (2010)

- Peer review process in 2010 determined the current LRP based on a scientific analysis of historic periods of stock productivity (ie, spawning stock biomass (or the weight in tonnes of mature fish), recruitment, etc.).

- The reference point was adopted in 2010, and was set at the average spawning stock biomass during the 1980s.

    - The 2J+3KL cod spawner biomass and recruitment remain at extremely low levels compared to the 1960s.

    - SSBs in the 1980s were the last to produce medium levels of recruitment.

    - After the 1980s, SSB has been low and recruitment poor, indicating that the stock has been below a level where *serious harm* occurs.

How science determined the Limit Reference Point (LRP) in 2010

- The 2010 meeting recommended the LRP for 2J3KL Northern cod be re-evaluated once more data, particularly at higher stock sizes, are available.

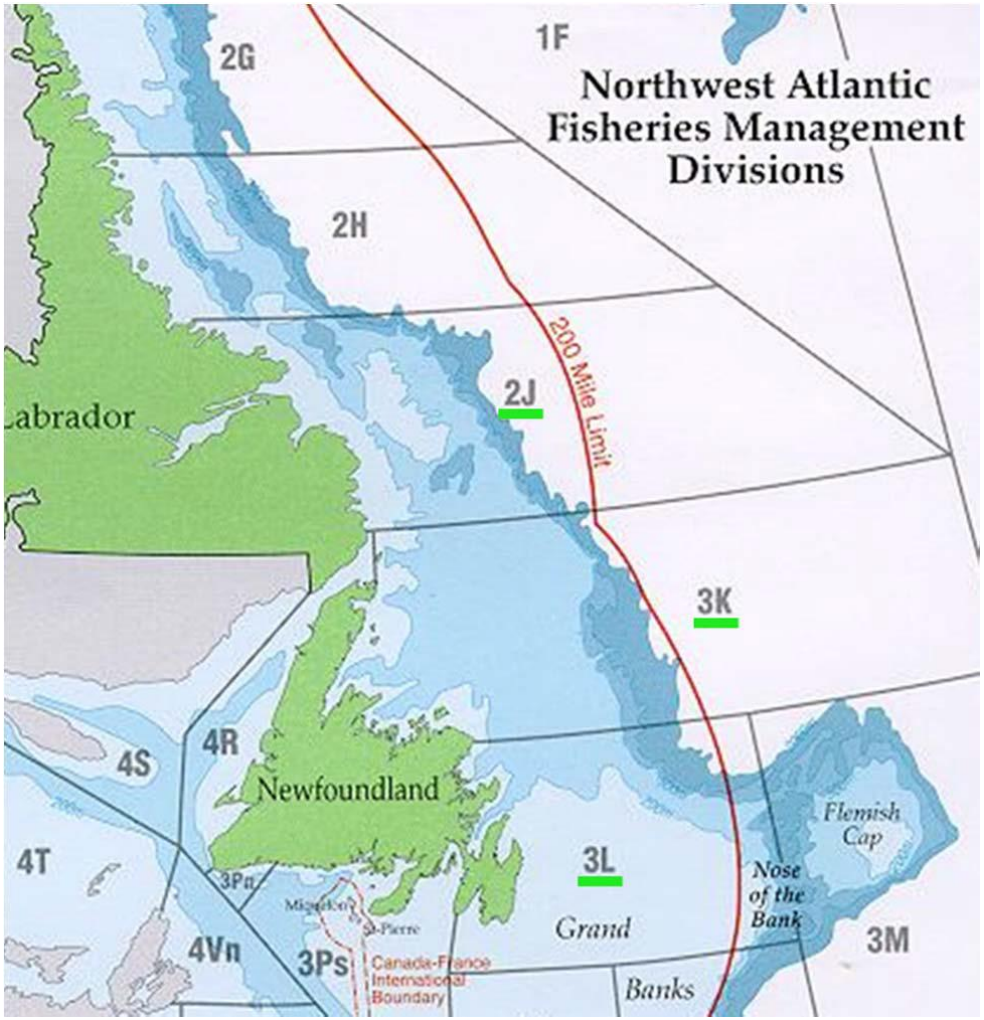
- The proceedings report from the 2010 process is available on the Canadian Science Advisory Secretariat website.

2019 CSAS Evaluation of the Limit Reference Point

Northern cod (2J3KL)

January 22-23

Northern cod areas



Why re-evaluate the LRP?

- The results of the 2010 science assessment indicated that LRP should be re-evaluated once more data, particularly at higher stock sizes, are available.

- Fisheries Management requested the current LRP be re-evaluated in accordance with the DFO Precautionary Approach Framework (PAF) to determine whether the previous approach to adopting the LRP (as well as the LRP itself) remain valid.

2019 regional peer review process

- The Canadian Science Advisory Secretariat (CSAS) regional peer review process that re-evaluated the Limit Reference Point for 2J3KL Northern cod was held January 22 - 23, 2019.

- Participants: DFO Science and Fisheries Management branches, Provincial Department of Fisheries and Land Resources, environmental non-governmental organizations (ENGOs), industry, academia, international experts and others with a specialization in the topic under review.

- This included three independent reviewers with an expertise in stock assessments, precautionary approach and limit reference points.

Science advice

The peer review meeting reached a consensus that *the method for determining the LRP and the reference point itself remain valid.*

Science advice

- Evaluation of the limit reference point (LRP) was based on biological and environmental information available for the stock area, 2018 stock assessment (1983-2018), and an exploratory population model that extended over a longer period (Extended Northern Cod Model; 1962-2018).

- The low spawning stock biomass levels since the 1980s have only produced poor recruitment, indicative of serious harm occurring on the stock. However, a gap remains in the stock-recruit relationship at spawning stock biomass levels between those of the 1980s and currently observed.

- The LRP will be re-evaluated with further information on the productivity of the stock within this range, through refinement of extended Northern Cod Model and/or future years with higher spawning stock biomass.

- Several metrics of productivity were examined and although variable, there is currently no evidence that Northern cod is experiencing a prolonged period of lower stock productivity.

How was the LRP evaluated?

- Our evaluation included discussions about:

  - Environmental and ecosystem conditions
  - The Northern Cod Assessment Model (NCAM), and extended assessment model
  - Northern cod stock and recruitment
  - Northern cod productivity – both individual measures of health as well as stock growth potential

Environment and ecosystem

- Ocean conditions of the Newfoundland and Labrador shelf are subject to decadal and multi-decadal cycles.

- Zooplankton and phytoplankton levels at a historical low.

- Environment and ecosystem factors will be assessed at the Northern cod stock assessment in March 2019.

Assessment models

- The accepted Northern Cod Assessment Model (NCAM) is a complex statistical model that has been peer-reviewed by international experts. The model integrates information on stock productivity.

- NCAM was extended to include more historical data for this review for the purposes of this evaluation.

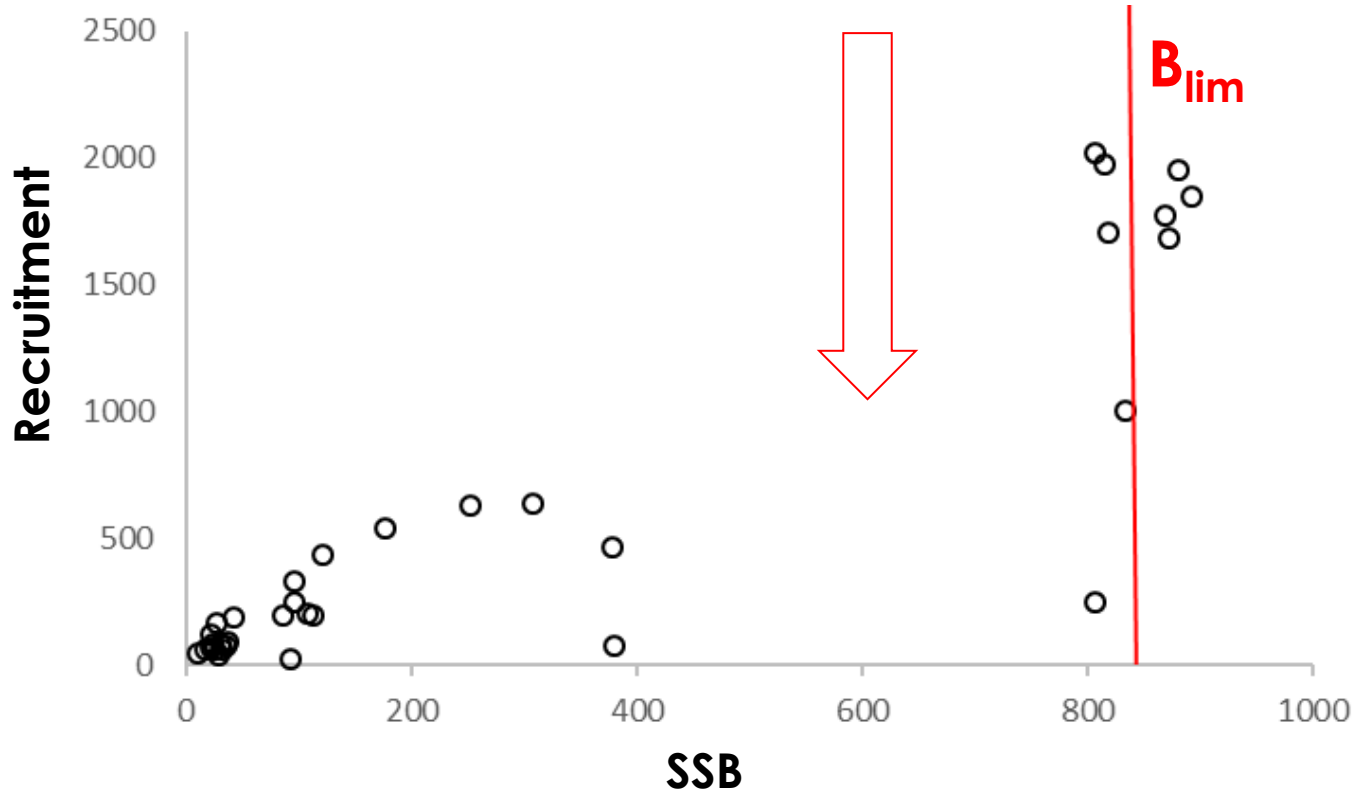
- Although provisional, the extended time series produced results consistent with historical stock assessments.

Northern cod spawners and recruits

- Some assumption that there is some relationship between the spawners and recruits (young fish, age 2) of a population of fish

Northern cod stock and recruitment

The low spawning stock biomass levels since the 1980s have produced poor recruitment, indicative of serious harm occurring to the stock.



Northern cod productivity

- Capacity of a population to produce biomass (weight); result of increases due to growth and reproduction, countered by declines due to mortality.

- Much variation in productivity over time series but since the mid 1990s there have been years of both high and low productivity.

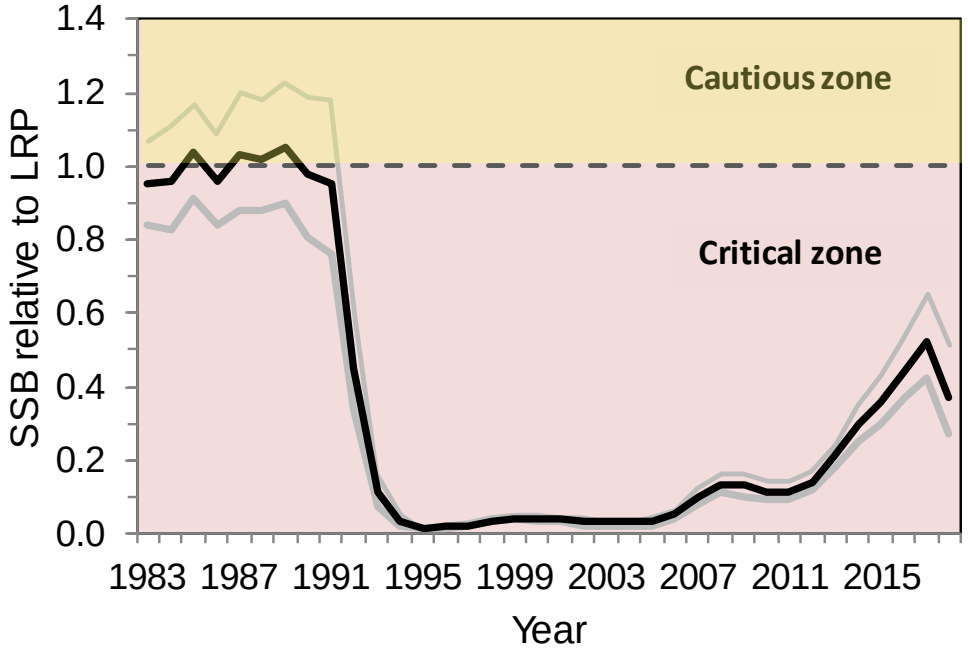
- Overall, no evidence that Northern cod is experiencing a prolonged period of low productivity that indicate historic levels of biomass cannot be reached in the future.

Changing a reference point should only occur when:

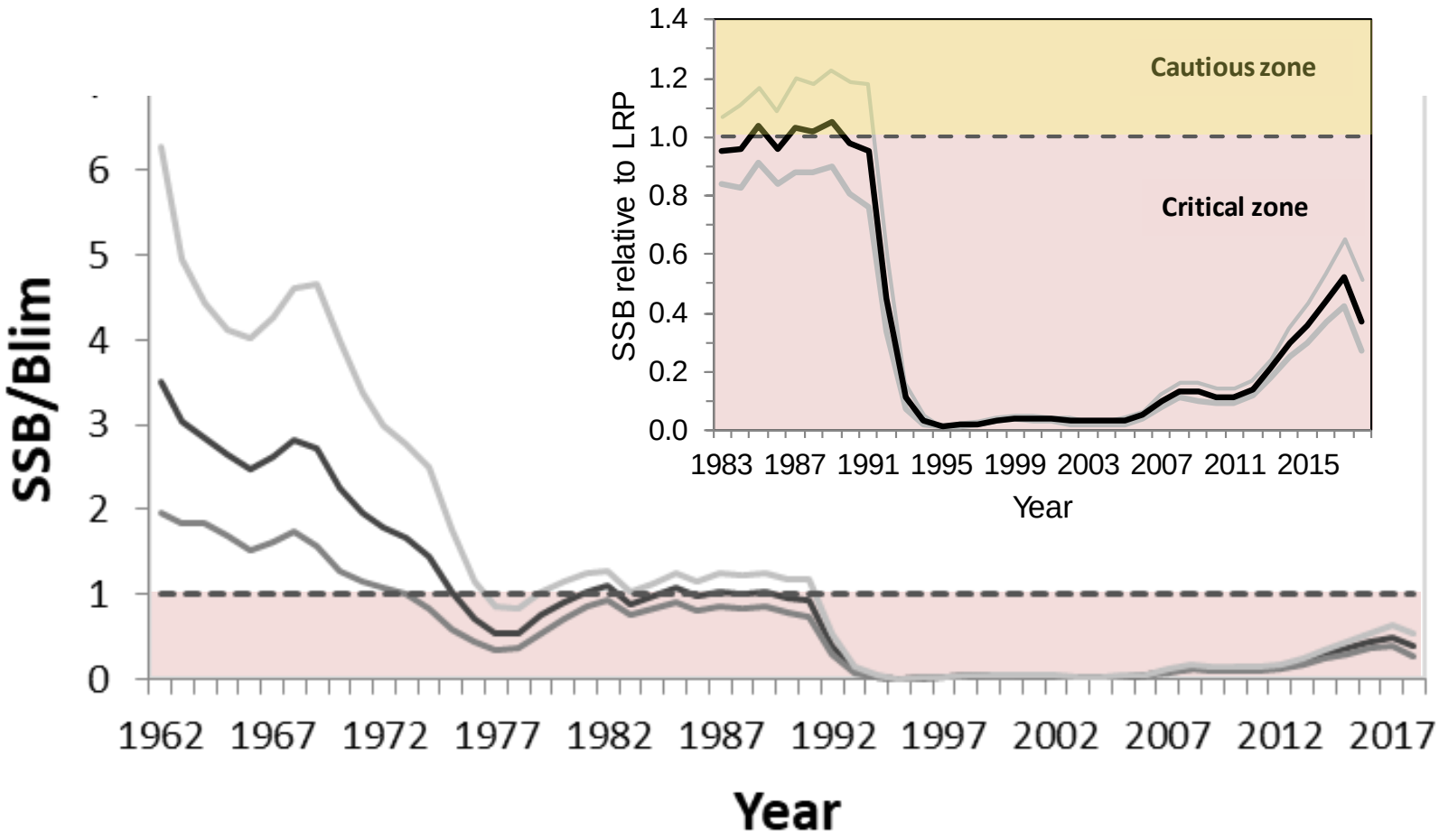
- There is a high probability of a regime shift: change in environmental conditions that has led to a change in stock productivity or multiple species of an ecosystem.
- When the mechanisms of this shift are understood;
- The shift cannot be reversed and;
- There is a change in the capacity of the environment to support the stock.
- ***All four conditions should be met.***

Overall status of Northern cod

- The Northern cod stock declined from 2017 to 2018 and remains in the critical zone.
- The SSB has declined from 441kt in 2017 to 315 kt in 2018.



Extended time series model



Next steps

- The science advisory report resulting from this meeting will be posted to the Canadian Science Advisory Secretariat website in the near future.

- The stock assessment for 2J3KL Northern cod will take place March 25 to 29. A technical briefing for industry and media about the results of this meeting will be provided.

- The Northern cod stock is assessed annually.

Sources of information

- Precautionary Approach Framework (http://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/precaution-eng.htm)

- Northern cod science advisory report (http://publications.gc.ca/collections/collection_2018/mpo-dfo/fs70-6/Fs70-6-2018-038-eng.pdf)

- Proceedings 2010 Framework for LRP (http://waves-vagues.dfo-mpo.gc.ca/Library/342802.pdf)

- Setting reference points and productivity (http://waves-vagues.dfo-mpo.gc.ca/Library/348613.pdf)

Questions?